

Spatial modelling for the rational allocation of the routinely distributed bed nets in public health facilities in Western Kenya

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Background

In high to moderate malaria transmission areas of Kenya, long-lasting insecticidal nets (LLINs) are provided free of charge to pregnant women and infants during antenatal care (ANC) and immunization. The clinics quantify their LLINs need based on monthly consumption data and population size of targeted counties. This quantification approach has often led to LLINs stock-outs at clinics.

Objective

We propose a framework to quantify LLINs need per clinic, compare the need with actual allocation and identify mis-allocation in high malaria transmission areas of Western Kenya (Fig. 1).

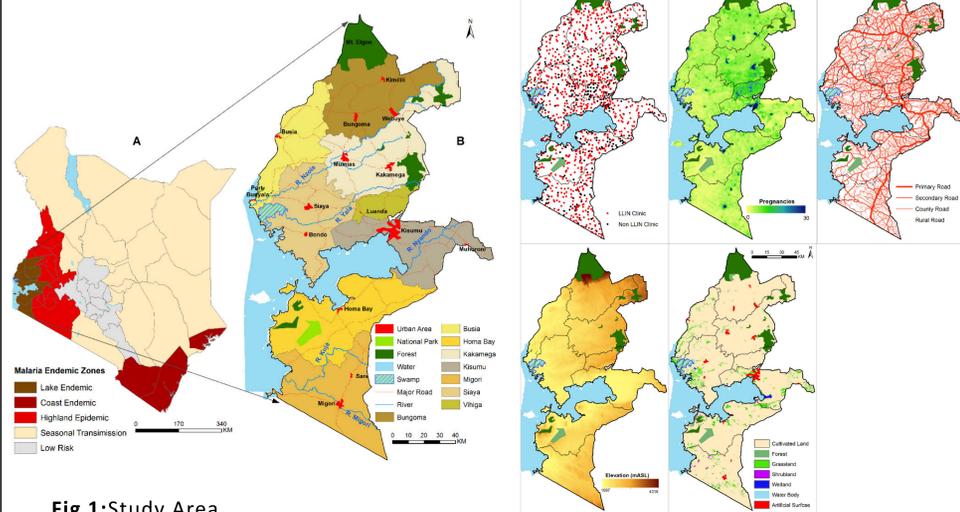


Fig 1: Study Area

Fig 2: Input datasets

Methods

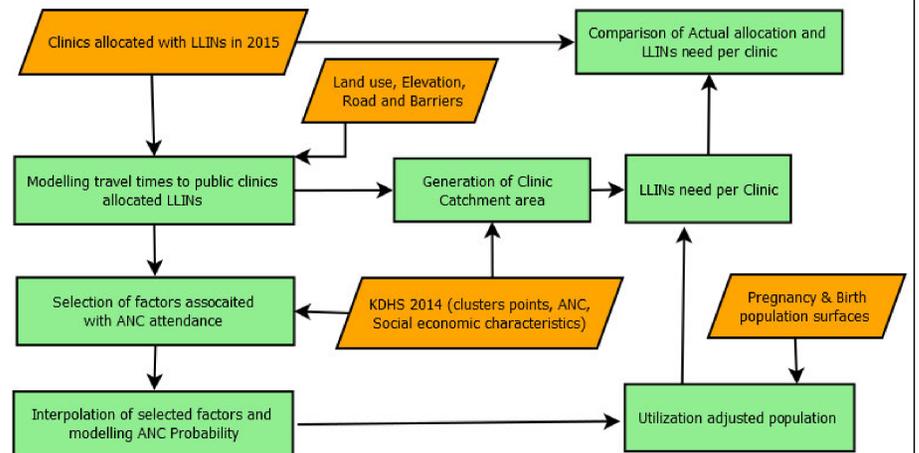


Fig 3: Methods

Geo-located clinics were linked with LLINs allocation list and used to model travel time to the clinics. The travel time, ANC attendance and socio-economic data were used to model catchment-areas and ANC-use probability grid. The grid was used adjust the population for utilization. Population per clinic catchment was extracted (LLIN need).

The need was compared with actual LLIN allocation to identify clinics where allocation matched the need, was lower or higher than the need. Approaches to minimize mis-allocation were proposed

Results

97% of the pregnant women and infants were within 40 minute-clinic catchment areas and 93% (682,377) were likely to have used clinic.

888 (70%) clinics received 591,880 LLINs, 90,497 less than the need. 95 areas were outside defined catchments

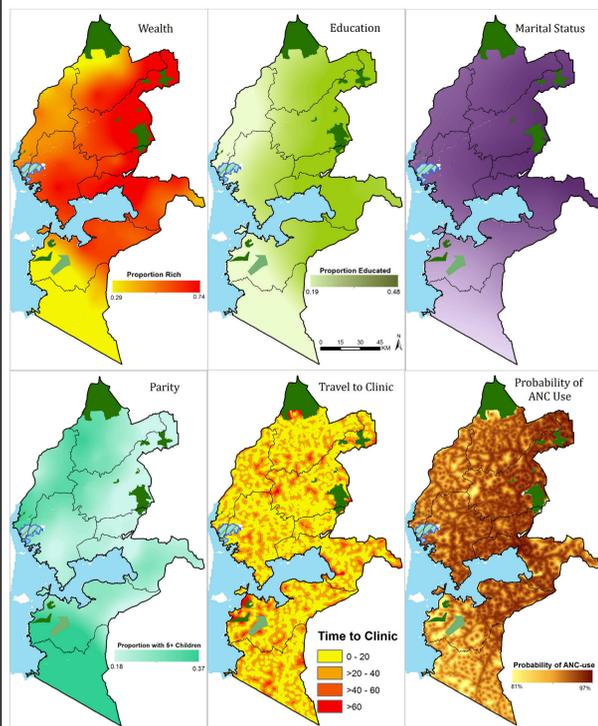


Fig 4: Spatial variation of social economic, access and probability of ANC-use

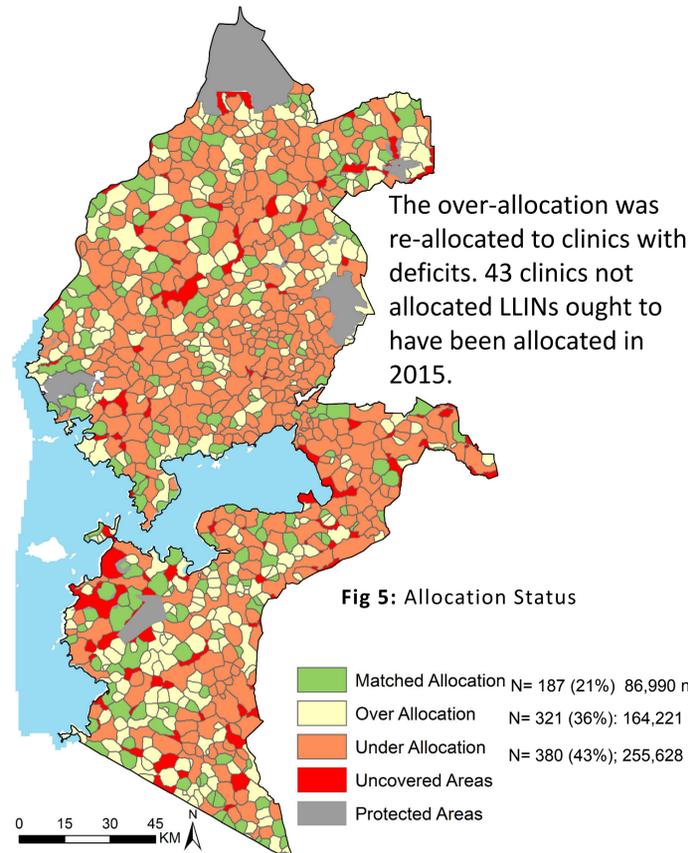


Fig 5: Allocation Status

Matched Allocation N= 187 (21%); 86,990 nets
Over Allocation N= 321 (36%); 164,221 nets
Under Allocation N= 380 (43%); 255,628 nets
Uncovered Areas
Protected Areas

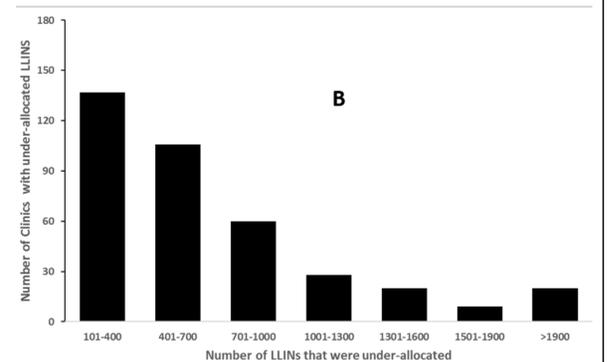
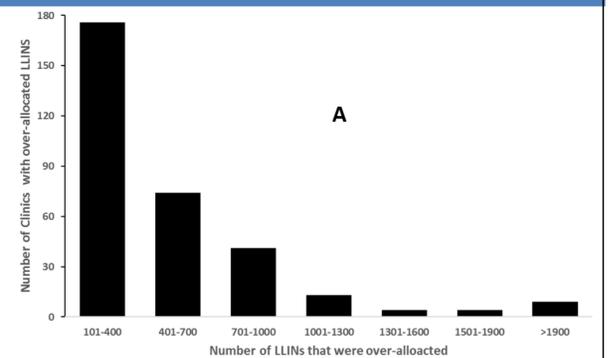


Fig 6: Number of clinics against number of LLINs that were over-allocated (A) or under-allocated (B)

Conclusions

The Western region of Kenya received adequate LLINs as per the government of Kenya targets. However, the model shows inefficiencies in the allocation of the LLINs at clinic level that needs addressing by including more clinics in the distribution chain and diverting over-allocation to clinics with deficiencies

The proposed LLIN allocation framework presents a rational approach that is spatially, socio-economic and demographically equitably targeted and could be employed for quantification of maternal and child health commodities in similar settings.